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I, LEANNE MYNOTT, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PP 7371 for a patent by BARTLEM PTY LTD filed on 27 November 1998.

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L. Mynott

LEANNE MYNOTT
TEAM LEADER EXAMINATION
SUPPORT AND SALES

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"METHODS OF AND APPARATUS FOR PREVENTING ENTWINEMENT OF ELONGATE FIBROUS ARTICLES"

This invention relates to methods of and apparatus for preventing or reducing entwinement of elongate articles about the drive shaft of rotary processing members.

Rotary processing devices such as rotary mowers and shredders are utilised to process long fibrous articles such as palm fronds, long grass and tree refuse and during processing, it is common for the material to become entangled about the drive shaft of the rotary processor. This entanglement can build up to such extent that it jams the machine and prevents further operation thereof or substantially reduces the efficiency of operation of the processor.

In some instances such entanglement about a drive shaft can damage seals and the like which extend about that drive shaft. Any build up of such refuse is also undesirable in instances where air flow paths are established in the rotary processor as those airflow paths may be significantly reduced by buildup about the drive shaft.

Rotary processors such as garden refuse shredders often have difficulty dealing with the wide variety of refuse such as leaves and or other small articles and large articles such as palm fronds.

In one aspect this invention aims to inhibit such entwinement about the drive shaft of rotary processing

members.

In another aspect this invention aims to provide an improved garden refuse shredder.

Accordingly, this invention in one aspect resides broadly in a method of inhibiting entwinement of elongate articles about the drive shaft of rotary processing members, the method including:-

forming a barrier wall about the drive shaft to substantially conceal access between the walls from and to which the drive shaft extends to the rotary processing member, and

providing complementary disrupting members on the respective walls from and to which the drive shaft extends to the rotary processing member, the disrupting members comprising fixed and stationary members which pass closely adjacent one another upon rotation of the rotary processing member so as to disrupt material tending to pass to the drive shaft.

The disrupting members may be arranged between the drive shaft and the barrier wall or at the side of the barrier wall which is remote from the drive shaft. Suitably the access path across the barrier wall and past the disrupting members in a circuitous or labyrinth path.

The complementary disrupting members may be a plurality of substantially identical complementary disrupting members arranged concentrically about the drive shaft. Each of the

complementary disrupting members may be a pair of anvil members which rotate past one another such as a pair of opposed pins or blades.

Suitably each of the complementary disrupting members includes a fixed anvil member such as a cylindrical projection and a blade member which passes closely adjacent exposed side and circular faces of the cylindrical projection. In one embodiment the or each cylindrical projection is constituted by the cylindrical head of a high tensile cap screw.

The method of inhibiting entwinement of elongate articles about the drive shaft of rotary processing member may also include providing air flow or pressure distribution arrangements about the drive shaft whereby matter disrupted by the complementary disrupting members is induced to flow away from the drive shaft.

In another aspect, this invention resides broadly in rotary processing apparatus of the type including a drive shaft extending from a fixed wall to an adjacent wall of a processing member driven for rotation by the drive shaft, the rotary processing apparatus including:-

a barrier wall mounted on one of said fixed or adjacent walls about the drive shaft and terminating close to the other

wall, and

complementary disrupting members extending from

respective said fixed and adjacent walls so as to pass closely adjacent one another upon rotation of the adjacent wall relative to the fixed wall.

A plumber block or the like bearing is suitably mounted on top of a horizontal fixed wall so as to support the rotary processing apparatus and cap screws, ie screws or bolts having cylindrical heads with a socket for receiving a key or the like, disposed equidistant from the axis of the drive shaft pass upwardly through the fixed wall into the base of the plumber block or the like and act as fixed disrupting members which cooperate with blades mounted on the adjacent wall. Suitably the blades have a horizontal part which terminates close to the outer ends of the cap screws and a vertical part which terminates close to the side walls of the cap screws.

In yet a further aspect this invention resides broadly in a rotary processor such as garden refuse shredder having a drive shaft driving a shredder disc mounted within a housing having an inlet for refuse to be shredded and an outlet for discharging shredded refuse, wherein:-

the shredder disc assembly for shredding refuse introduced to the housing through the inlet, and

impeller means associated with the shredder disc for inducing an inflow to the housing through the inlet and an outflow from the housing through the outlet. Suitably the

housing provides an expanding travel path for material entering through the inlet and passing to the outlet and more suitably this travel path is in the form of a volute or the like.

The drive shaft may be driven by an electric motor. Suitably the drive shaft is the output shaft of an internal combustion engine and the shredder disc assembly is driven by the output shaft but supported by bearing means independent of the internal combustion engine. The drive shaft may be a horizontal shaft but preferably the drive shaft is a substantially vertical shaft.

The shredder disc assembly suitably includes a relatively heavy disc supporting chipper blades thereon above apertures therethrough through which shredded refuse may pass to be discharged. The impeller means may be separate from the shredder disc assembly but suitably the impeller means is provided by vanes supported on the shredder disc assembly.

In order that this invention may be more readily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate a typical embodiment of the invention and wherein:-

Fig. 1 is a side view of the shredding apparatus fitted with a catcher;

Fig. 2 is corresponding view but shown without a catcher;

Fig. 3 illustrates the shredding apparatus disposed in a

servicing mode;

Fig. 4 is a part-sectional view of the rotor and its mounting;

Fig. 5 is a cutaway plan view of the rotor assembly;

FIGS. 6 and 7 illustrates in plan and side sectional views another embodiment of the rotor assembly;

FIGS. 8 and 9 illustrates in plan and side sectional views a further embodiment of the rotor assembly and its mounting details;

FIG. 10 is a detailed view of the barrier means of the embodiment illustrated in Fig. 9 for preventing entwinement about the drive shaft;

FIG. 11 is an exploded view of the rotor assembly of Fig. 9 and its mounting details;

FIG. 12 is an exploded view of the shredding apparatus according to the Fig, 9 embodiment, and

FIG. 13 illustrates the shredding apparatus illustrated in Fig, 12 opened for accessing the rotor assembly.

The garden shredding apparatus 10 illustrated in the drawings has a two-part housing 11 supported on rear wheels 12 and a front stand 13, a hopper assembly 14 and a small bore inlet chute 15 extending upwardly from the upper housing part 16 and a catcher 17 suspended from the front of the housing 11. The housing 11 contains a rotary chipper assembly 20, illustrated in Fig. 4, and supports a small petrol motor 21 thereabove for driving the rotary chipper

assembly 20.

Opposed pin hinges 22 attach the upper housing part 16 to the lower housing part 19 at the rear thereof which enable the upper housing part 16 and the components mounted thereon to fold to an open position, as illustrated in Fig. 3, at which the handle 24 rests on the ground and clear access is provided to the rotary chipper assembly 20 through the open underside of the top housing part 16. The front of the top housing part 16 is retained on the lower housing part 19 by bolts 25.

As illustrated in Figs. 4 and 5, the rotary chipper assembly 20 has a disc-like rotor 28 formed with opposed radially extending slots 27 at diametrically opposite positions and a chipper blade 30 bolted to the rotor 28 adjacent the trailing side of each slot 27.

Macerator blocks 29 are interposed between the blades 30 and are fixed to the rotor 28 with inner ends spaced from the hub 31 to which the rotor 28 is bolted. A pin 32 extends down from the end wall 33 of the upper housing part 16 toward the rotor 28 and is position between the hub 31 and the macerator blocks 29.

The hub 31 is formed at the lower end of a thick-walled sleeve 35 which is bored to accept the output shaft 36 of the motor 21 which is keyed thereto by a key in conventional manner. The lower end of the motor shaft 36 is threaded to receive a retaining bolt 37 which pulls the rotor 28 against

the end of the shaft 36. The rotor is also bolted to the hub 31 by bolts 38.

The sleeve 35 is supported by a large capacity self-aligning cam-lock bearing 40 which is secured to the end wall 33 through a stiffening boss 41. This bearing is locked to the motor shaft 36 so as to support the weight of and end thrust placed upon the rotor 28.

The bearing 40 also accommodates the side and impact loads imparted by the operation of the chipper blades 30. This isolates undesirable loads being applied to the crankshaft of the directly mounted motor 21 which is supported on a channel shaped mounting 23 fixed to the end wall 33. For this purpose the rotor 28 is relatively heavy so as to act as a flywheel. In this embodiment the rotor 28 is 5mm thick steel plate.

The underside of the rotor 28 has impeller blades 44 bolted thereto so as to create an air flow through the open front 45 of the housing 11. This induces a downdraught through the hopper assembly 14 and the small bore inlet chute 15 which assists in feeding material to be mulched therethrough toward the rotor 28.

The induced draught also throws shredded material through the outlet which is normally closed by a flap 47 hinged along its upper edge and pivotable upwardly to permit a conventional grass catcher 50 to be removably clipped to the housing 11 to receive the shredded material. Typically

the grass catcher 17 is interchangeable with the grass catcher from a domestic rotary mower.

It will be seen that the hopper assembly 14 has a forwardly convergent transition piece 51 extending from its underside to the inlet aperture formed in the top wall 33, while the inlet chute 15 is angled back to assist feeding of the material being fed therethrough toward the rotor 28.

In use when the rotor 28 is rotated at high speed, air is induced to flow through the hopper 14 and inlet chute 15, which may be capped if desired. This air flow assists in the feeding of material to be shredded to the rotor 28. Most of this matter will be shredded by the chipper blades 30 and pass through the apertures 27 for discharge to the catcher.

Should leafy material or stringy material move across the top of the rotor 28 toward the hub 31 it will be contacted by the macerator blocks 29 and be pulverised. These blocks cooperate with the pin 32 to prevent long lengths of material reaching the hub 31 and becoming entwined therearound.

In the event that the chipper blades need servicing, they can be access easily by releasing the bolts 25 and pivoting the top housing part to its open position as illustrated in Fig. 3. In this position the rotor 28 is stably supported for safe working conditions. An inlet safety flap 48 is pivotally attached to the upper end of the hopper to substantially close the hopper after the addition

of material to be shredded but providing an opening or leaving a gap thereabout for maintenance of an air flow therethrough to assist with the feeding and/or discharge process.

This arrangement provides a shredder of very simple form which has the bulk of its weight centralised between the wheels 12 and the stand 13 for stable operation. The weight of the hopper is offset by the catcher and the handle 24 provides for simple balanced wheeling of the shredder 10 from location to location and support for the opened housing.

The rotary chipper assembly 55 illustrated in Figs. 6 and 7 has opposed blades 56 formed with upturned cutting ends 57 at their inner ends, the blades 56 being bolted to the rotor 58. A complementary arcuate blade 59 centered on the rotor axis is fixed to the end wall 60 of the upper housing part and is located close to the upturned ends 57 as they rotate thereby to cut up long strands of matter which may be fed toward the boss 62. This prevents such long strands from winding about the boss and possibly entering the bearing seal of its supporting bearing.

~~The rotary chipper assembly 60 illustrated in Figs. 8 to~~ 13 has opposed blades 61 formed with upturned cutting or disrupting ends 62 which are shaped to pass closely about the end face 63 and side face 64 of the bolts 65 which bolt the end wall 66 to the heavy housing of the cam-lock nearing 67. In order that the ends 62 pass close to the bolts 65 they are

high tensile cap screws which have relatively deep cylindrical heads so that their angular adjustment will not vary the required close spacing. The blades 61 are bolted to the rotor 69.

An annular barrier wall 70 extends down from the end wall 66 to terminate closely adjacent the rotor 69 and about the hub assembly 71 which is carried by the cam-lock bearing 67. This hub is keyed to the drive shaft 73 of the motor 74 and a central retaining bolt extends through the rotor 69 into the shaft 73.

As can be clearly seen in Fig. 10, when the blades 61 are in line with one of the bolts 65 the only path thereacross to the hub assembly 71 is a circuitous or labyrinth path passing as per the arrow 75, being first about the side and end face of the bolts 65 and then past the barrier wall 70. This will provide an effective barrier against elongate fibrous articles entwining about the shaft. Material which travels inward beyond the chipper blades 76 will be resisted by the barrier wall 70 where it will be cut up or disrupted and then forced outwardly either by the motion of the rotor or the air flow across the rotor 69. The through bolts for the chipper blades 76 also secure the imperrer blades 77 to the rotor 69.

Fig. 12 illustrates the simple and easy to manufacture nature of the shredding apparatus, being formed mostly of folded sheet metal bolted together and punched for bolt on

mounting of the components such as the motor and bearing assembly, while Fig. 13 illustrates the ease of servicing the working components which are normally concealed within the rotor housing.

It will of course be understood that the above has been given by way of illustrative example of the present invention and that all such modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of the invention as is herein set forth.

DATED THIS twenty-seventh DAY OF November 1998.

BARTLEM PTY LTD

BY

PIZZEYS PATENT & TRADE MARK ATTORNEYS

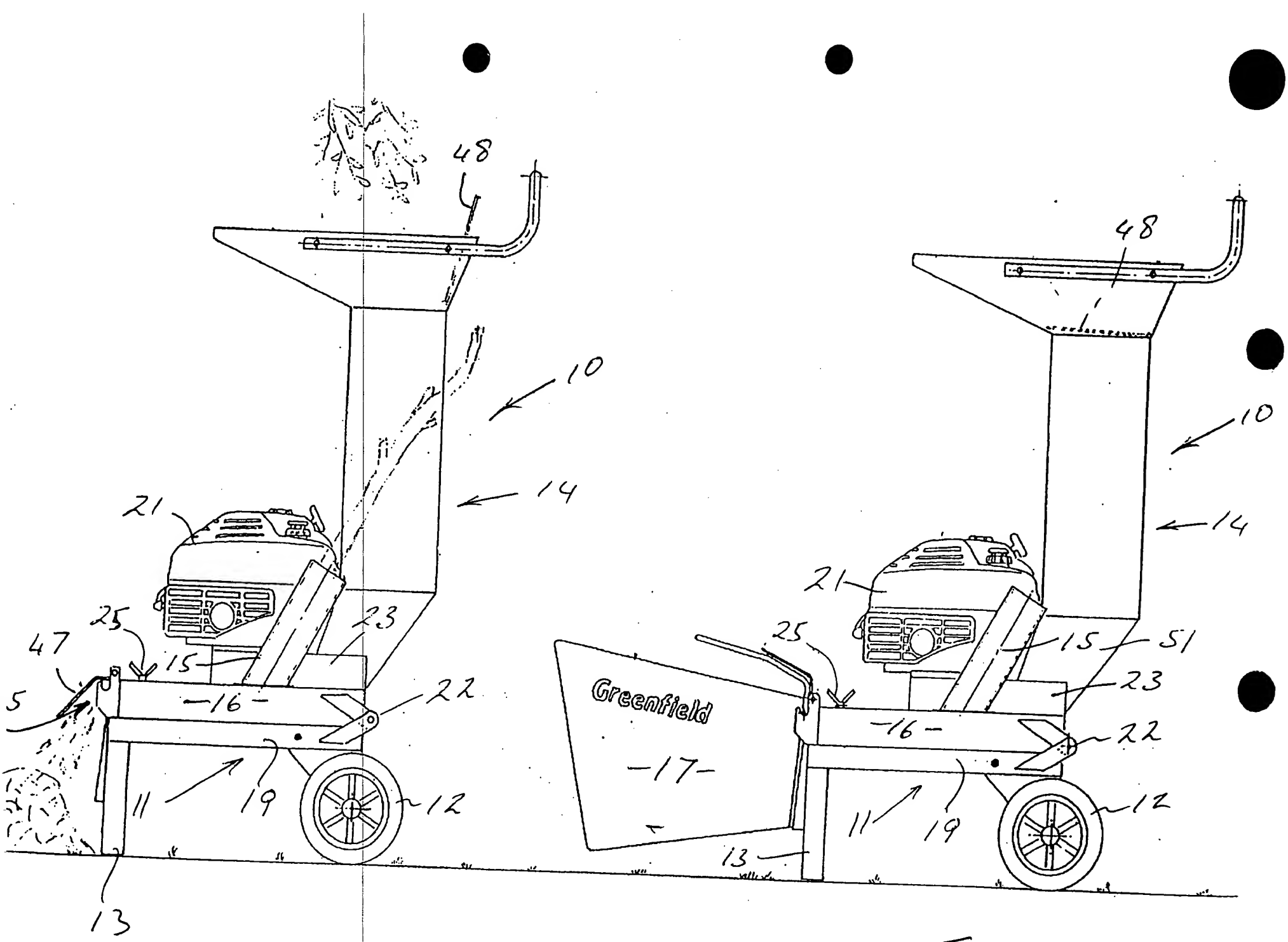
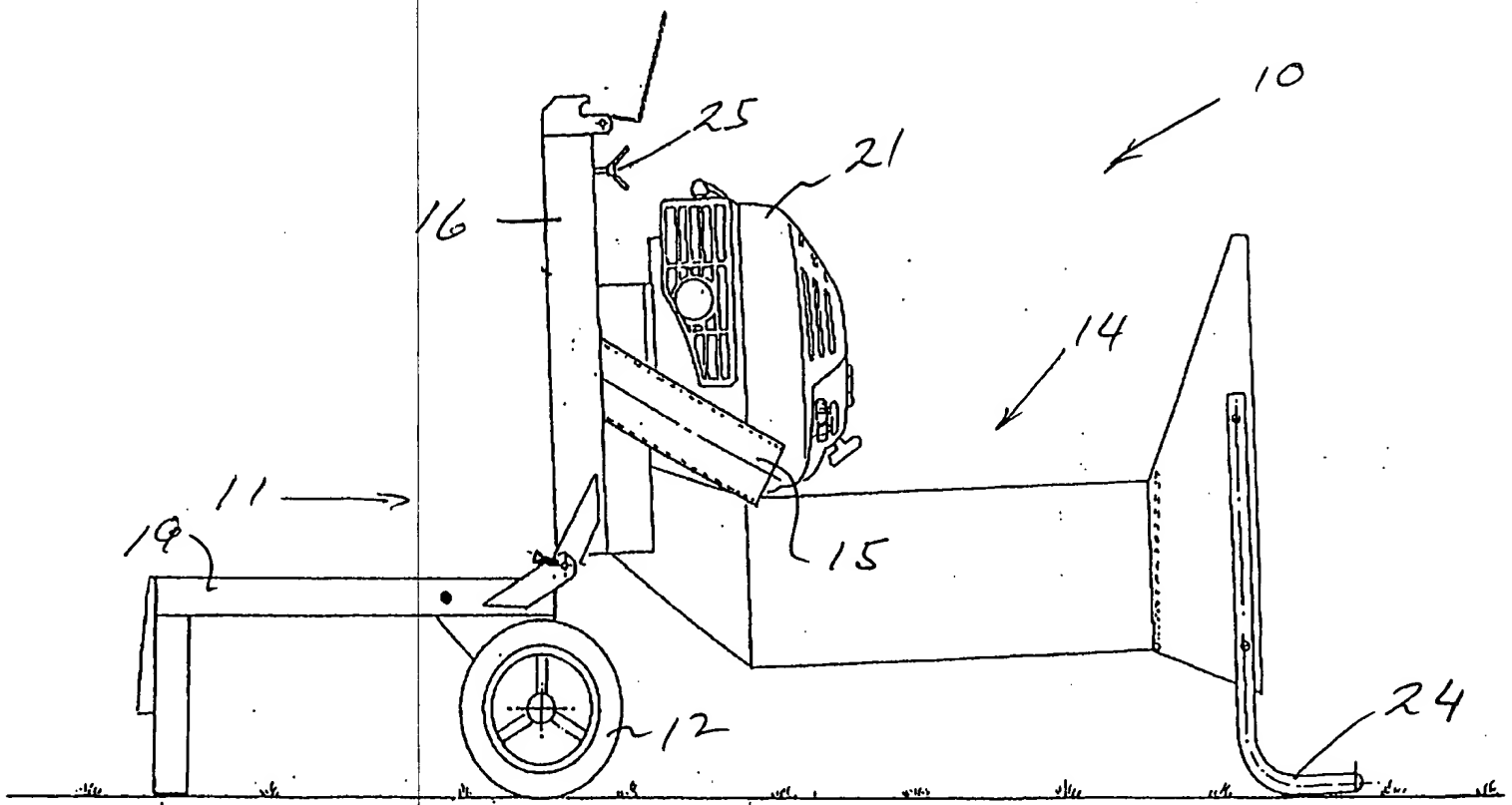


Fig. 2.

Fig. 1.



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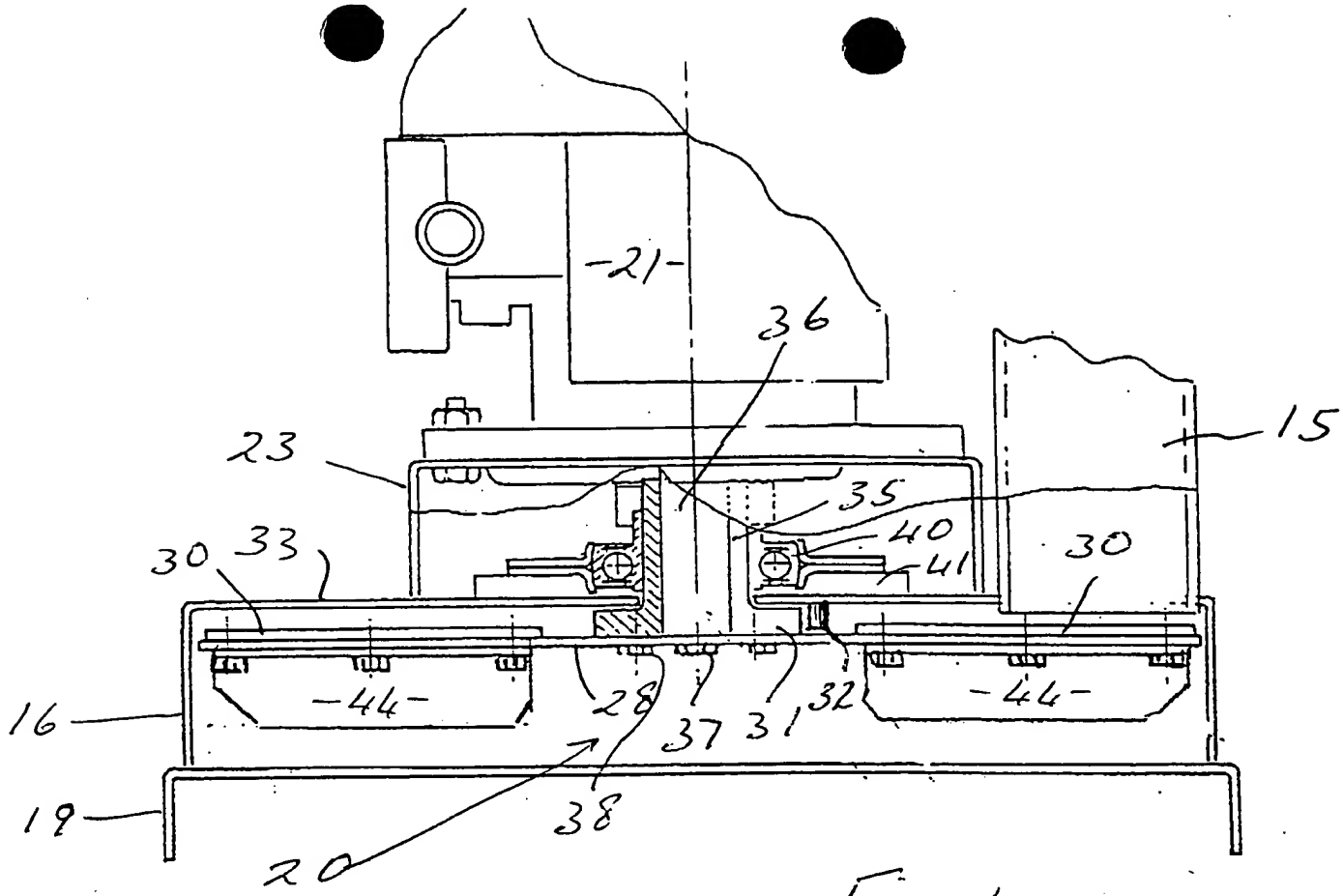
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Fig. 4.

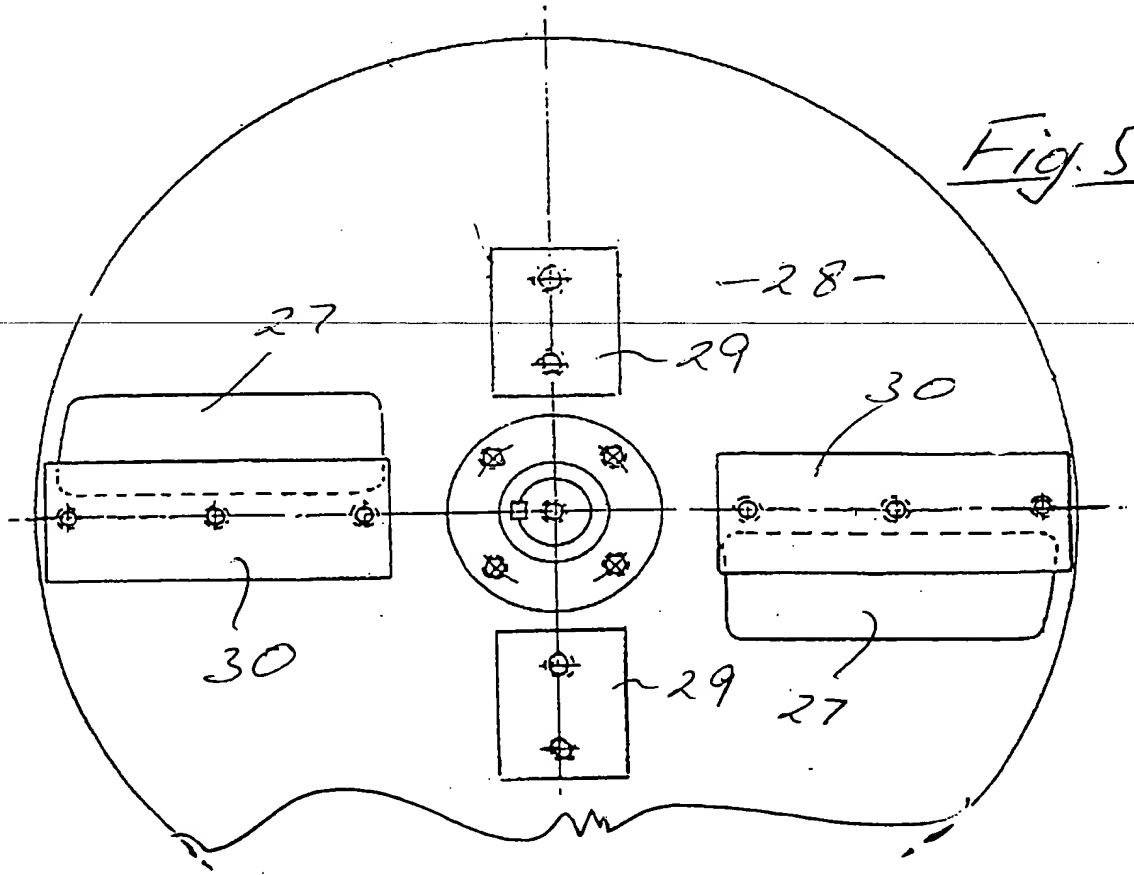
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Fig. 5.

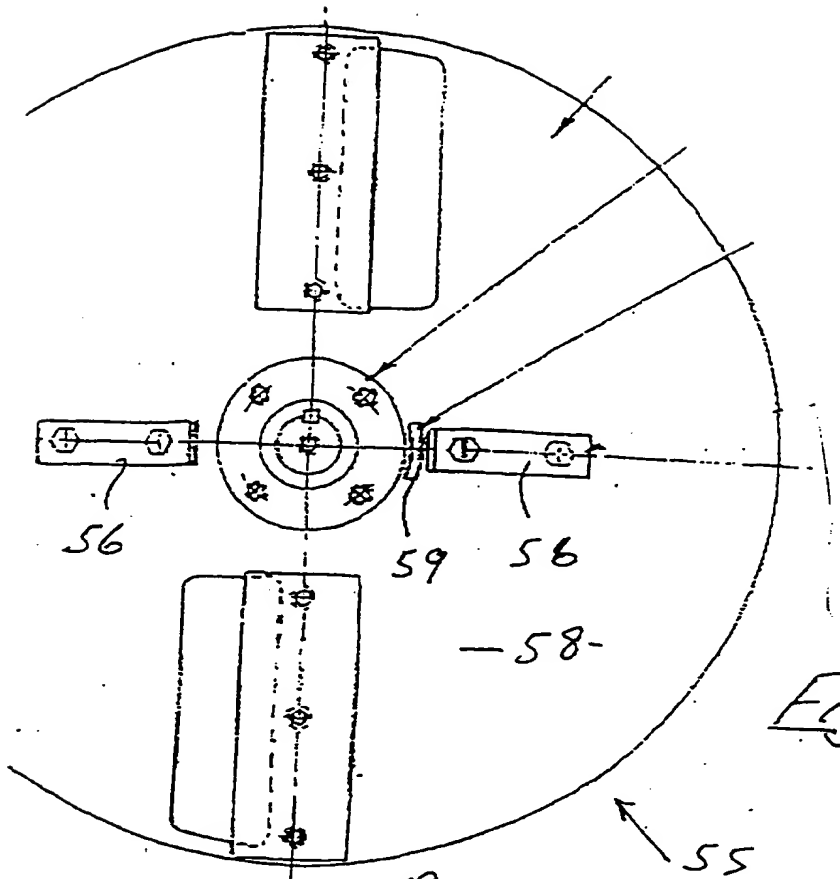

Fig. 6

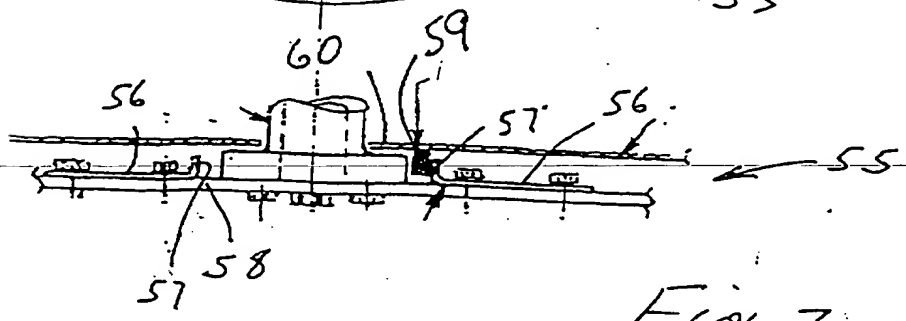

Fig. 7

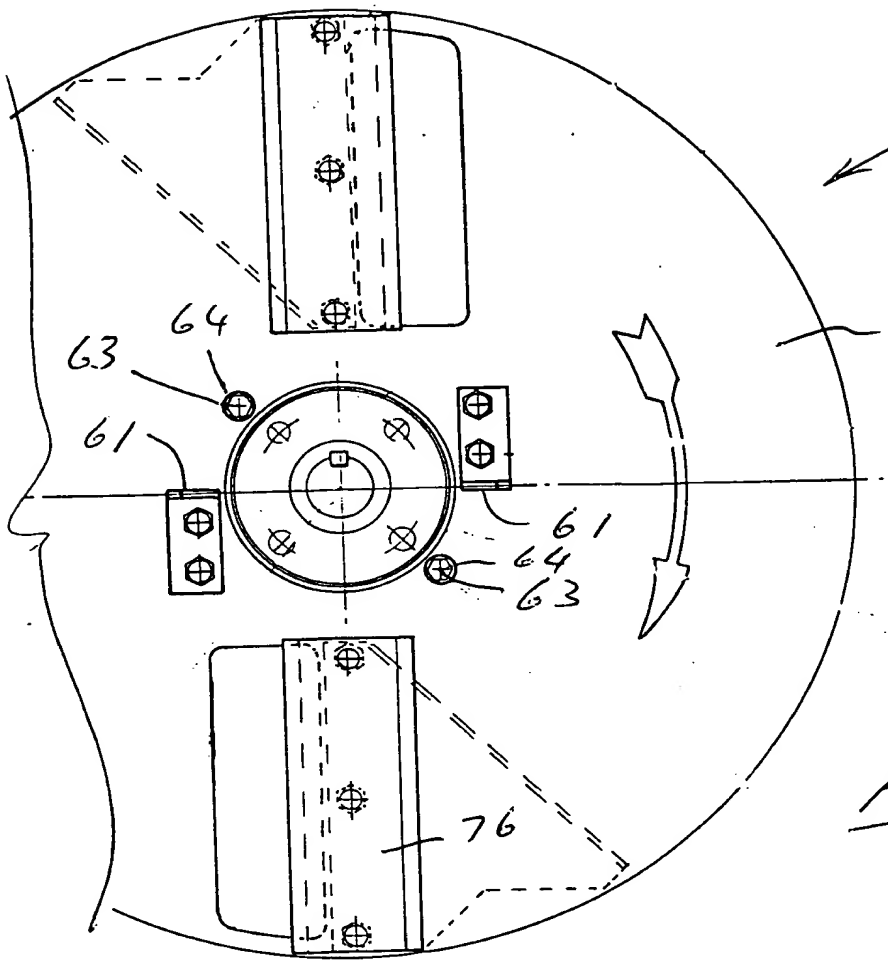

Fig. 8

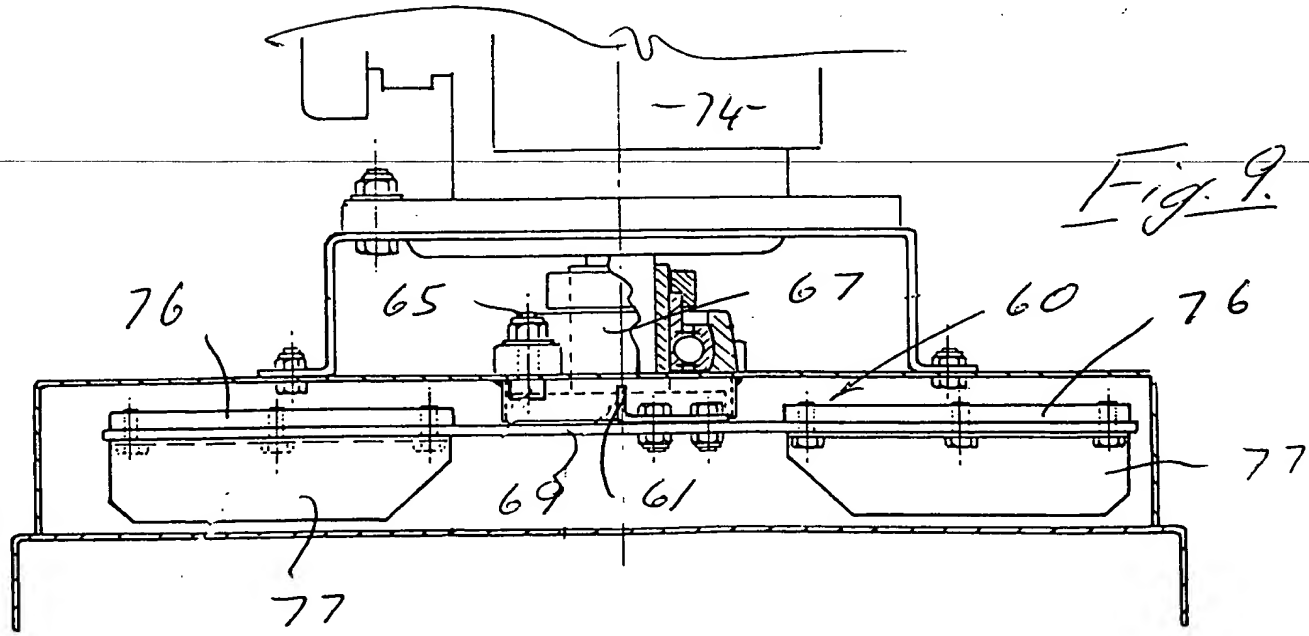

Fig. 9

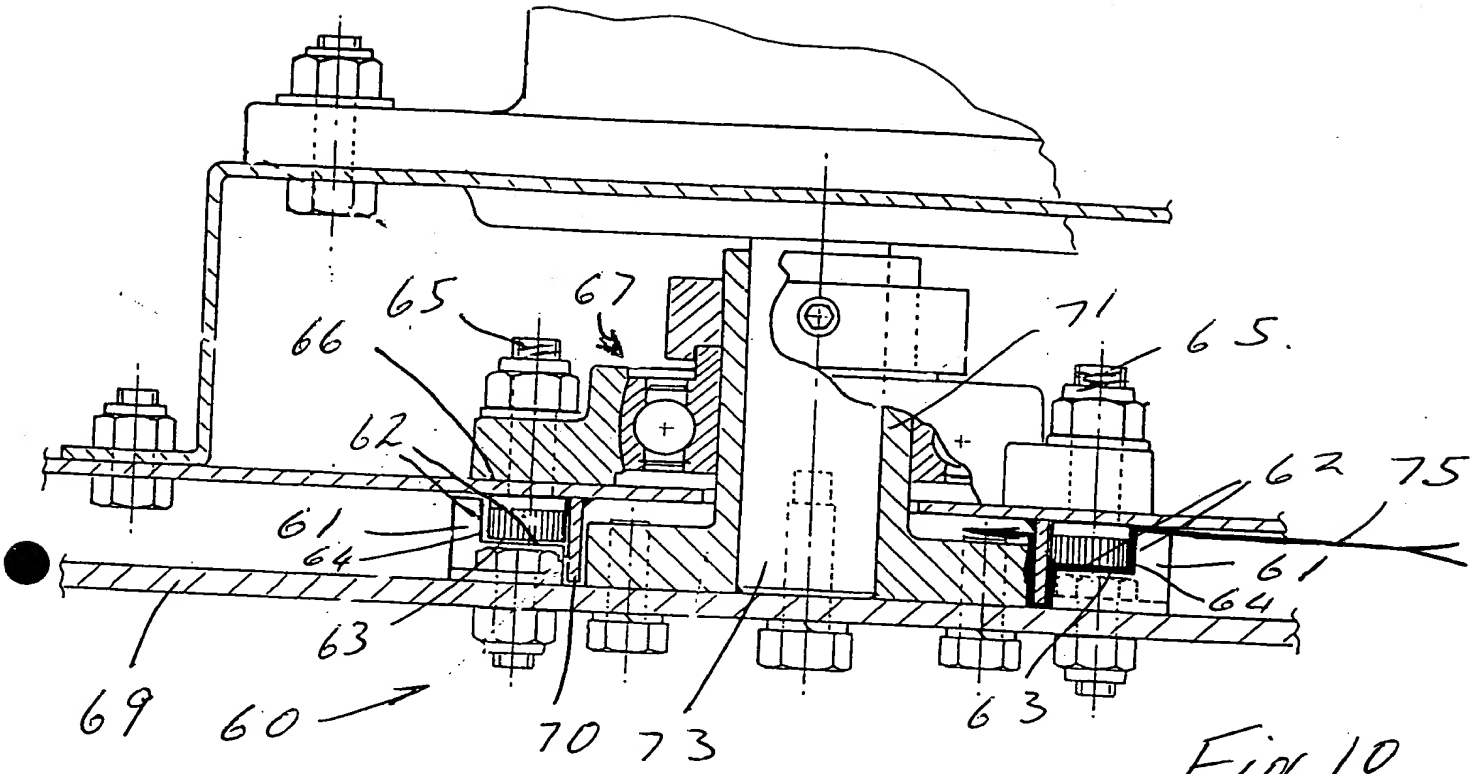
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Fig. 10

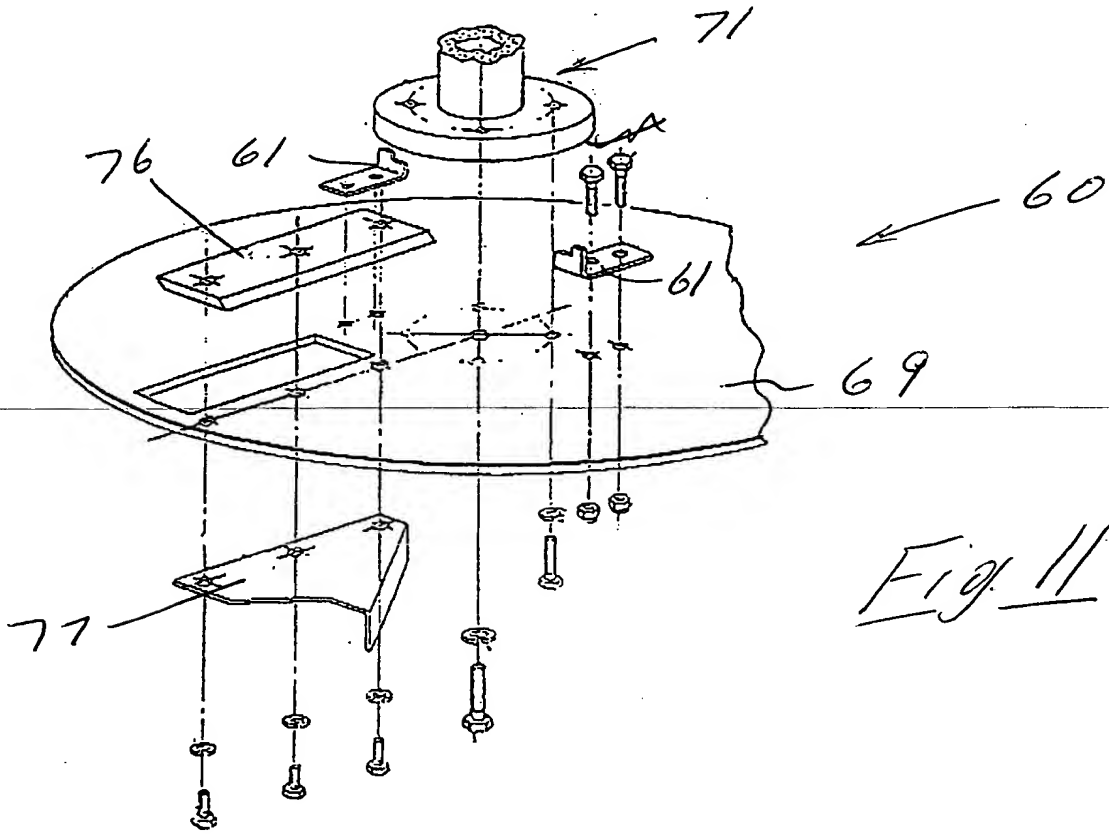
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Fig. 11

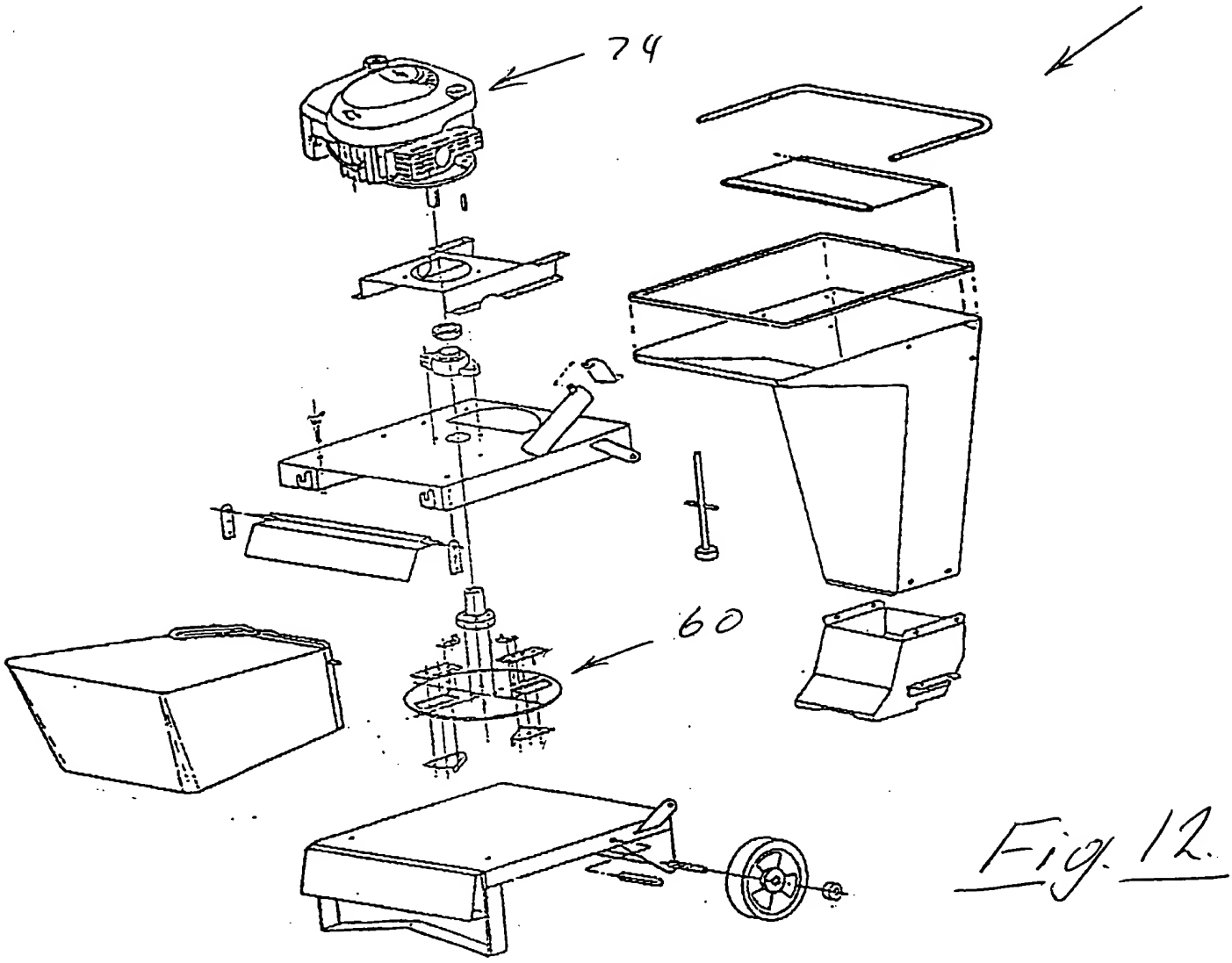

Fig. 12.

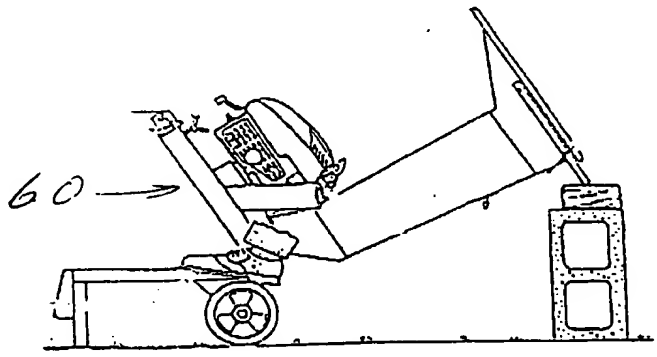

Fig. 13